

REMARKS

Reconsideration and allowance of the above-referenced application are respectfully requested.

I. STATUS OF THE CLAIMS

Claims 20 and 21 are amended herein.

In view of the above, it is respectfully submitted that claims 1-28 are currently pending and under consideration.

II. REJECTION OF CLAIMS 20-27 UNDER 35 U.S.C. § 102(B) AS BEING ANTICIPATED BY OLSON (USP# 5,838,338)

The present invention as recited in claim 20 (as amended herein), relates to “[a] method of adjusting a head gap in an inkjet printer comprising: receiving a head gap adjust command to rotate a carrier shaft with respect to a carrier from a control unit; reading out a head gap state stored in a non-volatile memory of the control unit; comparing a head gap position to be adjusted according to the received head gap adjust command to the head gap state read out from the non-volatile memory; adjusting the head gap position when the head gap position to be adjusted does not match the read-out head gap state as a result of the comparison; and storing an adjusted head gap state and waiting for printing.”

Olson teaches an adaptive media handling system, which is provided for an inkjet printing mechanism having a printhead that prints on media in a printzone. As pointed out by the Examiner, Olson teaches,

“To accommodate for manufacturing tolerance accumulations of the various parts used to construct the media transport system 60, the initial adjustment of the PPS spacing may occur at the factory. For instance, for a particular printer assume that the optimal adjust is determined to occur at an angle of 10.degree. for .theta. (FIG. 12). This 10.degree. rotation value may be easily translated in to a particular number of steps which motor 88 turns. This particular step value corresponding to .theta.=10.degree. then may be permanently stored in memory, such as in a read only memory (ROM) portion of the printer controller 36, and recalled for a nominal adjustment prior to printing.

It is apparent that the majority of this factory adjust process may be automated at the factory, rather than requiring extensive operator involvement, manual adjustments, tightening of set screws to hold

the adjustment, etc. This is especially true if the measurement device is some type of transducer, such as an optic device that generates measurement signals and provides them as input signals to the printer controller 36. In this manner, a smart self-testing printer 20 is provided. Alternatively, this factory adjust process may be performed in part by an auxiliary computer or other processor communicating with the printer controller 36. This system may also be advantageously used by personnel servicing a printer. In either implementation, human error is virtually eliminated from the process. The tolerance adjust value is stored in ROM in the printer controller, where it is accessed prior to each printing job (described further below). Thus, the printer cannot be jostled out of a mechanical adjustment during shipping.

The manner in which the printer controller 36 determines that an envelope is being feed to the printer rather than plain paper or other media, may be accomplished in a variety of ways. For example, it could be input by the user from a keypad on the printer exterior, or through user input from the host computer. Indeed, the host computer may automatically generate a PPS signal, corresponding to the number of motor step required, based upon the type of document being printed, without further user input. Alternatively, a media thickness sensor could be installed adjacent to chassis wall 68, to sense the thickness of an upcoming sheet of media. For instance, an envelope or other thick media may, for instance, taken an additional 10.degree. of rotation for angle .theta. (FIG. 12) to increase the .DELTA.Z PPS spacing (FIG. 13). When the controller 36 is made aware that an envelope is being printed, the controller can direct motor 88 to step not only the initial 10.degree. required to accommodate the particular printer tolerances, but an additional 10.degree. to increase the PPS spacing to accommodate the envelope. Upon determining the total number of motor steps required to adjust the PPS, the controller 36 then moves the carriage 40 to engage shift lever 130 to couple the adaptor cam 100 to motor 88." (See column 12, line 61 – column 13, line 44).

The Examiner believes that the above text from the Olson reference teaches the features as recited in claim 20. However, there is nothing in the above text that teaches or suggests a method of "receiving a head gap adjust command to rotate a carrier shaft with respect to a carrier from a control unit," "reading out a head gap state stored in a non-volatile memory of the control unit," "comparing a head gap position to be adjusted according to the received head gap adjust command to the head gap state read out from the non-volatile memory," "adjusting the head gap position when the head gap position to be adjusted does not match the read-out head gap state as a result of the comparison," and "storing an adjusted head gap state and waiting for printing."

The Examiner is reminded that to anticipate a claim, the reference must teach every element of the claim. MPEP § 2131. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Olson does not teach the features recited in claim 20. Moreover, Olson fails to describe each and every element, either expressly or inherently, in claim 20.

Further, according to the present invention, the head gap is adjusted according to the ascending movement of the carrier 120 by rotating the carrier shaft 150 with respect to the carrier 120. In Olson, however, the PPS spacing is adjusted by adjusting the height of the leading media support edge 82 of the media support member 80 with the PPS ping 86 of the media support member 80 and the PPS adjust portion 180 of the cam 100.

Claims 21-26 (dependent from claim 1) distinguish over the teachings of Olson for at least the same reasons that claim 20 distinguishes over Olson.

Regarding claim 27, the Examiner believes that Olson teaches, "the head gap is adjusted by using driving forces of the carrier driving unit and the paper supply roller driving unit" (see claim 27) in column 8, line 47 – column 9, line 3 of Olson. Olson teaches,

"Two guide ribs 124 and 126 are located along the interior surface of the chassis wall 66. As shown in FIG. 5, a pair of pivot pins, such as pin 128, extend inwardly from the ribs 124 and 126 to support a shift lever 130. As shown in FIG. 3, the outboard side of the cam gear 98 includes a raised disk portion 132, which is received within a U-shaped channel 134 defined by a lower extremity 136 of the shift lever 130. FIG. 6 shows an upper portion 138 of lever 130 being selectively engaged by a portion of the printhead carriage 40, to move the lever from the dashed line position to the solid line position (also shown in FIG. 4). The upper and lower portions 136, 138 of lever 130 are not coplanar, but instead are joined together at an obtuse angle, for instance, such as shown in FIG. 6. Thus, when the lever upper portion 138 is moved to the left in the views, the lever 130 pivots at pins 128 to force the lever lower portion 136 against the cam gear 98. Pushing the cam gear 98 toward the cam 100 compresses spring 120, and causes full engagement of the total width of teeth 105 with the teeth of the transfer gear 96. As the carriage 40 moves away from lever 130, for instance to print or to service the printheads 54, 56, the tension between the teeth of gears 96 and 105 maintains compression of the spring and full engagement of the gears as shown in solid lines in FIG. 6." (See FIG. 6 and column 8, line 47 – column 9, line 3 of Olson.)

According to the above, nothing in Olson teaches or suggests that a head gap is adjusted by using driving forces of a carrier driving unit and a paper supply roller driving unit as recited in claim 27 of the present invention. It is submitted that Olson fails to teach or suggest the features recited in claims 20-27 of the present invention.

In view of the above, it is respectfully submitted that the rejection is overcome.

III. REJECTION OF CLAIMS 1-4, 11-13, 15, 19, 20-26 AND 28 UNDER 35 U.S.C. § 103(A) AS BEING UNPATENTABLE OVER OLSON IN VIEW OF KAWAHARA (USP# 4,990,004)

The present invention as recited in claim 1, relates to an apparatus to adjust a head gap in an inkjet printer comprising "a carrier ascent/descent unit to rotate the carrier shaft with respect to the carrier to ascend and descend the carrier in order to adjust a head gap between the nozzles of the printer head and a respective sheet of paper; a clutch unit to transfer a driving force of the paper supply roller driving unit to the carrier ascent/descent unit by the carrier which moves by the carrier driving unit upon the adjustment of the head gap; and a control unit to store an adjusted head gap state and to adjust a head gap position required based on the stored adjusted head gap state."

The Examiner believes that Olson teaches the claimed clutch unit and the claimed control unit. Olson, however, teaches an adaptive media transport system which is fundamentally different from the present claimed invention.

Regarding the claimed clutch unit:

"Two guide ribs 124 and 126 are located along the interior surface of the chassis wall 66. As shown in FIG. 5, a pair of pivot pins, such as pin 128, extend inwardly from the ribs 124 and 126 to support a shift lever 130. As shown in FIG. 3, the outboard side of the cam gear 98 includes a raised disk portion 132, which is received within a U-shaped channel 134 defined by a lower extremity 136 of the shift lever 130. FIG. 6 shows an upper portion 138 of lever 130 being selectively engaged by a portion of the printhead carriage 40, to move the lever from the dashed line position to the solid line position (also shown in FIG. 4). The upper and lower portions 136, 138 of lever 130 are not coplanar, but instead are joined together at an obtuse angle, for instance, such as shown in FIG. 6. Thus, when the lever upper portion 138 is moved to the left in the views, the lever 130 pivots at pins 128 to force the lever lower portion 136 against the cam gear 98. Pushing the cam gear 98 toward the cam 100 compresses spring 120, and causes full engagement of the total width of teeth 105 with the

teeth of the transfer gear 96. As the carriage 40 moves away from lever 130, for instance to print or to service the printheads 54, 56, the tension between the teeth of gears 96 and 105 maintains compression of the spring and full engagement of the gears as shown in solid lines in FIG. 6." (See FIG. 6 and column 8, line 47 – column 9, line 3 of Olson.)

The Examiner believes that the above text from the Olson reference teaches the claimed clutch unit. However, nothing in the above text teaches or suggests a clutch unit to transfer a driving force of the paper supply roller driving unit to the carrier ascent/descent unit by the carrier which moves by the carrier driving unit upon the adjustment of the head gap as recited in claim 1.

Regarding the claimed control unit:

"The printer 20 also has a printer controller, illustrated schematically as a microprocessor 36, that receives instructions from a host device, typically a computer, such as a personal computer (not shown). Indeed, many of the printer controller functions may be performed by the host computer, by the electronics on board the printer, or by interactions therebetween. As used herein, the term "printer controller 36" encompasses these functions, whether performed by the host computer, the printer, an intermediary device therebetween, or by a combined interaction of such elements. The printer controller 36 may also operate in response to user inputs provided through a key pad (not shown) located on the exterior of the casing 24. A monitor coupled to the computer host may be used to display visual information to an operator, such as the printer status or a particular program being run on the host computer. Personal computers, their input devices, such as a keyboard and/or a mouse device, and monitors are all well known to those skilled in the art." (See column 5, line 53 – column 6, line 4 of Olson.)

"It is apparent that the majority of this factory adjust process may be automated at the factory, rather than requiring extensive operator involvement, manual adjustments, tightening of set screws to hold the adjustment, etc. This is especially true if the measurement device is some type of transducer, such as an optic device that generates measurement signals and provides them as input signals to the printer controller 36. In this manner, a smart self-testing printer 20 is provided. Alternatively, this factory adjust process may be performed in part by an auxiliary computer or other processor communicating with the printer controller 36. This system may also be advantageously used by personnel servicing a printer. In either implementation, human error is virtually eliminated from the process. The tolerance adjust value is stored in ROM in the printer controller, where it is accessed prior to each printing job (described further below). Thus, the printer cannot be jostled out of

a mechanical adjustment during shipping.

The manner in which the printer controller 36 determines that an envelope is being feed to the printer rather than plain paper or other media, may be accomplished in a variety of ways. For example, it could be input by the user from a keypad on the printer exterior, or through user input from the host computer. Indeed, the host computer may automatically generate a PPS signal, corresponding to the number of motor step required, based upon the type of document being printed, without further user input. Alternatively, a media thickness sensor could be installed adjacent to chassis wall 68, to sense the thickness of an upcoming sheet of media. For instance, an envelope or other thick media may, for instance, taken an additional 10.degree. of rotation for angle .theta. (FIG. 12) to increase the .DELTA.Z PPS spacing (FIG. 13). When the controller 36 is made aware that an envelope is being printed, the controller can direct motor 88 to step not only the initial 10.degree. required to accommodate the particular printer tolerances, but an additional 10.degree. to increase the PPS spacing to accommodate the envelope. Upon determining the total number of motor steps required to adjust the PPS, the controller 36 then moves the carriage 40 to engage shift lever 130 to couple the adaptor cam 100 to motor 88." (See column 13, lines 6-44 of Olson.)

The Examiner believes that the above text from the Olson reference teaches the claimed control unit. Nothing in the above text teaches or suggests a control unit to store an adjusted head gap state and to adjust a head gap position required based on the stored adjusted head gap state as recited in claim 1.

Further, the Examiner believes that Kawahara teaches the claimed carrier ascent/descent unit as described in FIG. 1 and the Abstract of Kawahara.

For example,

A printer having a device for advancing and retracting a print head toward and away from a paper supporting platen, an automatic head gap adjusting device for controlling the head advancing and retracting device, to advance the print head until the print head comes into contact with a recording paper, and then retracting the print head by a predetermined distance, to thereby adjust a head gap between the paper and the print head, and an operator-controlled head gap adjusting device for manually operating said head advancing and retracting device, to thereby adjust the head gap. A mode selector is provided for selecting one of an automatic adjusting mode in which the head gap is adjusted by the automatic head gap adjusting device, and a manual adjusting mode in which the head gap is adjusted by the operator-controlled head gap

adjusting device. (See Abstract of Kawahara.)

However, nothing as described in the above text of Kawahara teaches or suggests a carrier ascent/descent unit to rotate the carrier shaft with respect to the carrier to ascend and descend the carrier in order to adjust a head gap between the nozzles of the printer head and a respective sheet of paper as recited in claim 1. As shown FIG. 8 of the Applicant's specification, for example, the carrier ascent/descent unit of the present invention is constructed with both ends 150' and 150" of the carrier shaft 150 forming an eccentric cam in order for the center axis 196' (refer to FIG. 8) of the eccentric cam to become eccentric by a certain amount with respect to a center axis 211 of the carrier shaft 150. The carrier ascent/descent unit 113 is also constructed with support bushings 114 respectively disposed on the side frames 112 and 112' of the chassis 110 to accommodate and support both ends 150' and 150" of the carrier shaft 150. As the both ends 150' and 150" of the carrier shaft 150 having the center axis 196' eccentric with respect to the center axis 211 of the carrier shaft 150 rotate in the support bushings 114 by the clutch unit 190 and the eccentric rotation gear 196, the carrier shaft 150 rotates about the center axis 196' of the both ends 150' and 150" thereof. Therefore, the carrier 120 fixed to the carrier shaft 150 through the support bracket 126 may upwardly ascend or downwardly descend by a distance allowed for the center axis 211 of the carrier shaft 150 to vertically move (that is, by twice as much as the eccentric amount of the center axis 196' of the both ends 150' and 150" with respect to the center axis 211). See paragraphs 0045-0047 of the Applicant's specification.

Kawahara merely teaches,

"When the head gap is adjusted, the eccentric support shaft is rotated by a suitable drive source, whereby the intermediate portion of the eccentric support shaft is displaced in the transverse direction of the platen. Since the intermediate portion of the eccentric shaft is rotatable relative to the hollow guide sleeve, the hollow guide sleeve and the carriage are also displaced in the same direction as the intermediate portion of the eccentric support shaft, without rotation of the hollow guide sleeve and the carriage relative to the platen. Thus, the rotation of the eccentric support shaft provides a movement of the carriage and the print head as a unit, in the transverse direction of the platen, by an amount corresponding to an angle of rotation of the eccentric support shaft. This head supporting device can be used as part of the head advancing and retracting device for adjusting the head gap." (See column 6, lines 46-62.)

A person of ordinary skill in the art would not understand the above-described teachings of Kawahara to teach the claimed carrier ascent/descent unit. Accordingly, Olson and

Kawahara, either alone or in combination, do not teach the features recited in claim 1 of the present invention.

On page 9 of the Office Action, the Examiner asserts that the combination of Olson and Kawahara “naturally suggests a clutch unit to transfer a driving force of the paper supply roller driving unit to the carrier ascent/descent unit by the carrier which moves by the carrier driving unit upon the adjustment of the head gap.” However, the Examiner has not presented any evidence why Olson and Kawahara would have been combined. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. MPEP § 2143.01. Specifically, there must be a suggestion or motivation in the references to make the combination or modification. Id. The Examiner’s sole support for such a combination is that “the combination *naturally* suggests a clutch unit to transfer a driving force of the paper supply roller driving unit to the carrier ascent/descent unit by the carrier which moves by the carrier driving unit upon the adjustment of the head gap” (emphasis added). The Examiner cannot rely on the benefit of the combination without first supporting the motivation to make the combination. Such motivation does not appear anywhere in any of the references, and the Examiner has not presented any actual evidence in support of the same. Instead, the Examiner relies on broad conclusory statements, subjective belief, and unknown authority. Such a basis does not adequately support the combination of references. Therefore, the combination is improper and must be withdrawn.

Similar to claim 1, claim 28 recites, “a carrier ascent/descent unit to rotate the carrier shaft with respect to the carrier to ascend and descend the carrier in order to adjust a head gap between the nozzles of the printer head and a respective sheet of paper; a clutch unit to transfer a driving force of the paper supply roller driving unit to the carrier ascent/descent unit by the carrier which moves by the carrier driving unit upon the adjustment of the head gap; and a control unit to store an adjusted head gap state and having a nonvolatile memory to adjust a head gap position required based on the stored adjusted head gap state, wherein, the nonvolatile memory is used rather than an additional head gap sensor to adjust the head gap position.” Thus, Olson and Kawahara, either alone or in combination, do not teach the features recited in claim 28 of the present invention.

Claim 20 recites, “[a] method of adjusting a head gap in an inkjet printer comprising: receiving a head gap adjustment command from a control unit; reading out a head gap state stored in a non-volatile memory of the control unit; comparing a head gap position to be adjusted

according to the received head gap adjustment command to the head gap state read out from the non-volatile memory; adjusting the head gap position when the head gap position to be adjusted does not match the read-out head gap state as a result of the comparison; and storing an adjusted head gap state and waiting for printing." Olson and Kawahara, either alone or in combination, do not teach the features recited in claim 20 of the present invention.

Dependent claims 2-4, 11-13, 15, and 19 (depending, either directly or indirectly, from claim 1) and dependent claims 21-26 (depending, either directly or indirectly, from claim 20) recite patentably distinguishing features of their own, and further, are at least patentably distinguishing due to their dependencies from independent claims 1 and 20. For example, in contrast to Olson and Kawahara, dependent claim 2 provides, "wherein the carrier ascent/descent unit comprises: both ends of the carrier shaft which form eccentric cams having a center axis eccentric by a certain amount with respect to a center axis of the carrier shaft; and support bushings to support the both ends of the carrier shaft." The Examiner relies on column 8, lines 19-21 of Kawahara, which teaches, "[t]he supports shaft 18 has opposite eccentric end portions 26, 26 which are rotatably supported by the printer frame." Thus, Kawahara fails to teach the features as recited in claim 4 of the present invention.

In view of the above, it is respectfully submitted that the rejection is overcome.

IV. CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that each of the claims patentably distinguishes over the prior art, and therefore defines allowable subject matter. A prompt and favorable reconsideration of the rejection along with an indication of allowability of all pending claims are therefore respectfully requested.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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